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STUDIES ON SHELL AND MEAT COMPOSITION OF MOLLUSCS FROM SAURASHTRA COAST

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ABSTRACT

Shell composition of 35 species of molluscs was studied. The shell, calcium and calcium carbonate contents were lowest in the cuttle bone of cuttlefish, while they were highest in shell of *Cypraea ocellata*. *Solen* sp. had higher meat and protein content than the pelecypods and lower meat, water and protein content than the cephalopods. Inverse relationships between water and fat, and protein and ash were established.

INTRODUCTION

In most of the molluscs, the shell forms a large percentage of body weight. If the molluscan fisheries are to be economically viable, profitable uses for the shells have to be found besides the meat which generally commands fairly attractive prices. It was therefore, considered important to estimate calcium and calcium carbonate in the shells of various species of molluscs. This perhaps may help the number of calcium based small or medium scale industries in Gujarat. Gokhale (1960) has indicated the use of window pane oyster for obtaining calcium.

The marine edible razor shell, *Solen* sp. (Fam : Solenidae) occurs throughout the year in good quantity between the inter tidal areas in the Gulf of Kutch, particularly on the northern side of Gopi (lat. 22°24' N long. 69°04' E). Razor shell is used as food and partly as fish bait for long lining in Maharashtra (Nayar and Mahadevan, 1974). However, this bivalve is not used for human consumption in Saurashtra, but used only as bait.

MATERIAL AND METHODS

The specimens were collected from different centres (Tables I & II) as a part

of study programme on molluscs (Sarvaiya, 1977 a,b,c). As the razor shells escape quickly into their burrows, their collection is not easy. Hence a mixture of sodium chloride and commercial sodium carbonate (soda ash) in a proportion of 1:1 was sprinkled in burrow. Then a thick stick was rotated in the burrow and slowly pulled up with rotating movement. Thus razor shell came out with stick. Live specimens were brought to the laboratory, washed and weighed after removing adhering water with filter paper. The length of each specimen measured and segregated into five groups viz. 121 - 130 mm (A), 111 - 120 mm (B), 101 - 110 mm (C), 91 - 100 mm (D) and upto 90 mm (E) in case of razor shell. The weight of shell and meat was obtained as per the methods described earlier (Sarvaiya, 1977 a,b). Group wise shell and meat percentage were obtained in case of razor shell. Calcium and calcium carbonate in the shells and moisture, protein, ash, salt and fat in the meat were estimated by the methods of Vogel (1961) and A.O.A.C. (1970). Calcium and calcium carbonate values reported here are for the entire gross shell without removing the outer shell layer.

Table I: Shell composition of Gastropoda of the Saurashtra coast

Molluscan species	Collection centre	Physical composition	Chemical composition Percentage of	
		Shell %	Calcium carbonate	Calcium
Nerita albicilla Linn.	Okha	79.1	92.60	37.53
N. dombeyi R'ecluz	Adatra	78.7	89.52	36.64
Trochus rediatus Gmelin	Aramda	-	88.05	37.60
T. stellatus Gmelin	Okha	78.5	89.65	37.35
Cantharus undosus (Linn.)	Okha	-	88.99	37.23
Astrea semicostata (Kiener)	Okha	79.2	90.12	37.20
Thais rugosa (Born)	Poshetra	80.1	88.00	36.96
Turbo intercostalis Menke	Okha	75.8	88.54	36.64
T. coronatus Gmelin	Okha, Poshetra, Balapur	80.7	87.15	36.08
Cerithium obeliseus Brugniere	Aramda	-	88.85	37.04
Murex adustus Lamarck	Nora Island, Okha	88.2	89.45	38.17
Tibia curta Sowerby	Off Dwarka	85.3	89.00	36.85
Bursa spinosa (Lamarck)	Off Dwarka	56.3	88.85	37.35
Tonna dolium L.	Off Dwarka	51.9	87.73	37.93
Pyrula ficus L.	Off Dwarka	24.4	91.60	37.85
Telescopium telescopium Linn.	Baida Island, Sikka	83.1	91.95	39.61
Xancus pyrum (Linn.)	Baida Island	78.8	90.40	38.70
Diodara bombayana (Sowerby)	Ajad Island	-	91.45	38.24
Turritella acutangula (Linn.)	Ajad Island	-	92.25	39.37
Natica tigrina (Roding)	Okha	-	92.10	38.89
Bulla ampulla Linn.	Ajad Island	-	91.50	37.04
Cypraea ocellata Linn.	Okha	-	94.50	39.91
Mean		72.9	90.10	37.68

Table II: Shell composition of Pelecypoda, Amphineura and Cephalopoda of Saurashtra coast

Molluscan species	Collection centre	Physical composition	Chemical composition Percentage of	
		Shell %	Calcium carbonate	Calcium
Class: PELECYPODA				
Pinna atropurpurea Sowerby	Ajad Island	79.5	85.28	36.08
P. bicolor Gmelin	Ajad Island	74.9	87.70	37.08
Pitar erycina (Linn.)	Gopi area	50.3	91.95	38.96
Paphia textile (Gmelin)	Baida Island	-	92.10	39.65
Cardium assimile Reeva	Baida Island	-	90.40	38.68
Arca gubernaculum Reeva	Ajad Island	-	90.90	37.36
Dosinia puella Anges	Baida Island	-	86.80	37.20
Crassostrea gryphoides (Newton & Smith)	Poshetra, Balapur	78.8	86.85	36.88
C. cucullata (Born)	Poshetra, Balapur	79.9	88.54	37.23
Placenta placenta (Linn.)	Poshetra	79.5	91.95	39.00
Solen truncatus Wood	Gopi area	79.5	93.25	39.52
	Mean	67.1	89.61	37.97
Class: AMPHINEURA				
Ischnochiton sp.	Okha	69.0	90.75	37.20
Class: CEPHALOPODA				
Sepiella inermis (F'erussac & d'Orbigny)	Off Dwarka	3.1	79.05	33.15

RESULTS AND DISCUSSION

A. Shell composition

Wide variations were noted in the shell percentage of gastropods and pelecypods but in most of the case it ranged from 74.9 to 86.3%. It was as high as 88.4% in the case of *Murex adustus* and as low as 24.4% in the case of *Pyrula ficus* (Table I & II). The observed shell percentage (20.3 - 30.9%) for razor shell (Table III) was relatively lower as compared to the shell percentage of most of the species of Pelecypoda studied by Sarvaiya (1977 b). The cephalopod, *Sepiella inermis* had very low shell content of only 3.1% amongst the different species studied. The chiton, *Ischnochinton sp.* had a shell content of 69.0%.

Mean percentage of 90.75, 79.05, 89.61 and 90.1 of calcium carbonate were noted in the shells of Amphineura, Cephalopoda, Pelecypoda and Gastropoda respectively. Amongst the species studied, *Sepiella inermis* had the lowest calcium carbonate content (79.05%) and *Cypraea ocellata* had the highest calcium carbonate (94.05%) in the shell. The average calcium carbonate content of 87.38% by dry weight of shell was obtained for the various molluscan shells.

The range of calcium content valued from 33.15% for *Sepiella inermis* to 39.91% for *Cypraea ocellata* with a mean of 36.5% dry weight of shell. These values very well agree with those reported by Rao *et al.* (1986). The calcium

Table III: Groupwise physical composition of razor shell of the Gulf of Kutch, Figures in paranthesis are mean values.

Group (mm)	Length (mm)	Fresh weight with shell (g)	Percentage on fresh weight basis	
			Shell	Meat
121-130 (A)	121-130 (124)	37-52 (44)	27.4	46.1
111-120 (B)	111-120 (116)	31-45 (38)	26.2	45.3
101-110 (C)	103-110 (106)	28-31 (30)	20.3	53.4
91-100 (D)	92-100 (97)	17-26 (21)	21.5	53.8
Upto 90 (E)	61-77 (70)	7-10 (9)	30.9	46.3

content values of gastropods (36.06-39.91%), pelecypods (36.08-39.65%) and ampheneurans (37.2%) were of in a very close range.

B. Meat composition

Meat percentage (45.3-53.8%) in the case of razor shell was relatively higher as compared to the meat percentage of most of the species of pelecypoda studied by Sarvaiya (1977 b; Table III). The meat percentage of razor shell is also relatively higher as compared to most of the species of gstropods studied by Sarvaiya (1977 a).

The water, protein, fat, salt and ash contents of the meat varied from 74.99-78.4%, 60.37-70.00%, 2.50-4.25%, 1.19-3.69% and 6.25-10.00% respectively. The water content of *Solen* sp. was lower than recorded for most of the species of Pelecypoda and Cephalopoda (Sarvaiya, 1977 b,c). *Solen* sp. had a higher protein content than most of the species of pelecypods but the value was lower than cephalopods (Sarvaiya, 1977 b,c). Lower and higher ash content was observed in *Solen* sp. as compared to most of the species of gastropods and cephalopods respectively (Sarvaiya, 1977 a,c).

Comparison of water, protein, fat and ash contents in five size groups indicate interesting relationships. With the increase of water content, the fat content decreased and *vice versa.* This inverse relationship has been reported

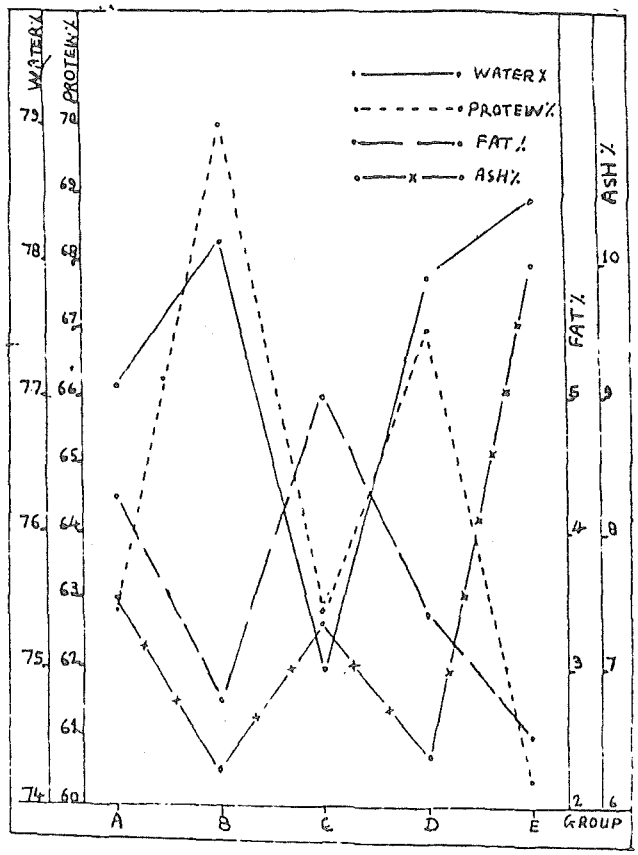

Fig.1 Percentage of water, protein, fat and ash content in the meat of five groups of *Solen* sp. Percentage of protein, fat and ash given on dry meat weight basis.

earlier in the black pomfret (Venkataraman, *et al.*, 1968). In the present study the inverse relationship between protein and ash is also noteworthy (Fig.1). Similar relationship between protein and ash has been reported earlier (Sarvaiya, 1977 a,b,c) in *Thaisrugosa, Crassostrea gryphoides, C. cucullata, Placenta placenta, Murex virgineus, Loligo sp., Sepiella inermis and Octopus sp.*

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